1-) $(\sin x)' = \cos x$, 2-) $(\cos x)' = -\sin x$ — Türev

3-) $(\tan x)' = \sec^2 x = 1+\tan^2 x = \frac{1}{\cos^2 x}$

4-) $(\cot x)' = -\csc^2 x = -(1+\cot^2 x) = -\frac{1}{\sin x}$

5-) $(\text{Arcsin}x)' = \sin^{-1}x$, 6-) $(\text{Arcsin}x)' = \frac{1}{\sqrt{1-x^2}}$

7-) $(\text{Arccos}x)' = -\frac{1}{\sqrt{1-x^2}}$ 8-) $(\text{Arctan}x) = \frac{1}{1+x^2}$

9-) $(\text{Arccot}x)' = -\frac{1}{1+x^2}$, $\cot x = \frac{\cos x}{\sin x}$, $\sec x = \frac{1}{\cos x}$

$\tan x \cdot \cot x = 1$, $\tan x = \frac{\sin x}{\cos x}$

10-) $\sin^2 x + \cos^2 x = 1$, 11-) $[\log_a f(x)]' = \frac{f'(x)}{f(x)} \cdot \log_a e$

12-) $[\ln f(x)]' = \frac{f'(x)}{f(x)} \cdot \log_e e$, 13-) $[\ln(\sin x)]' = \frac{\cos x}{\sin x} = \cot x$

14-) $[\ln(\text{Arcsin}x)]' = \frac{\frac{1}{\sqrt{1-x^2}}}{\text{Arcsin}x} = \frac{1}{\text{Arcsin}x \cdot \sqrt{1-x^2}}$

15-) $[\ln(x \cdot \sin x)]' = \frac{1 \cdot \sin x + \cos x \cdot x}{x \cdot \sin x}$

16-) $[a^{f(x)}]' = f'(x) \cdot a^{f(x)} \cdot \ln a$

17-) $[e^{f(x)}]' = f'(x) \cdot e^{f(x)} \cdot \ln e$

18-) $[e^{(e^x)}]' = (e^x)' \cdot e^{(e^x)}$

$y = e^v \Rightarrow y' = v' \cdot e^v$

$y = a^v \Rightarrow v' \cdot a^v \cdot \ln a$

$y = \log_a v \Rightarrow y' = \frac{v'}{v} \cdot \log_a e$

$y = \ln v \Rightarrow y' = \frac{v'}{v}$

19-) $\Delta = b^2 - 4ac \Rightarrow \underset{a}{1} \cdot x^2 + \underset{b}{2}x - \underset{c}{7} = 0$

$x_{1,2} = \frac{-b \mp \sqrt{\Delta}}{2a}$, $\Delta < 0 \Rightarrow$ kök yok, $\Delta = 0 \Rightarrow$ tek kök, $\Delta > 0 \Rightarrow$ farklı iki kök var.

20-) $i^2 = -1$, $i = \sqrt{-1}$

21-) $y = x^n \Rightarrow y' = n \cdot x^{n-1}$ $y = c \cdot x^n \Rightarrow y' = c \cdot n \cdot x^{n-1}$

22-) $[f(x) \mp g(x)]' = f'(x) \mp g'(x)$

23-) $[f(x) \cdot g(x)]' = f'(x) \cdot g(x) + g'(x) \cdot f(x)$

24-) $\left[\frac{f(x)}{g(x)}\right]' = \frac{f'(x) \cdot g(x) - g'(x) \cdot f(x)}{(g(x))^2}$

25-) Zincir → $\left([f(x)]^n\right)' = n \cdot [f(x)]^{n-1} \cdot f'(x)$

Örnek: $\left([x^2+3x-5]^3\right)' = 3 \cdot (x^2+3x-5)^2 \cdot (2x+3)$

26-) Kuvvet fonksiyonu → $[f^2(x)]' = 2 \cdot f(x) \cdot f'(x)$

27-) $[f(x) \cdot g(x^2)]' = f'(x) \cdot g(x^2) + g'(x^2) \cdot 2x \cdot f(x)$

28-) $\left[\frac{f(x)}{g^2(x)}\right]' = \frac{f'(x) \cdot g^2(x) - 2g(x) \cdot g'(x) \cdot f(x)}{g^4(x)}$

29-) $\left[\sqrt{f(x)}\right]' = \frac{f'(x)}{2\sqrt{f(x)}}$ 30-) $(\sin u)' = \cos u \cdot u'$

31-) $[\sin(x^2+2x)]' = \cos(x^2+2x) \cdot (2x+2)$

32-) $[\sin^3(x^2)]' = 3 \cdot \sin^2(x^2) \cdot \cos x^2 \cdot 2x$

33-) $(\sin^2 x)' = 2 \cdot \sin x \cdot \cos x = \sin 2x$

34-) $[\sin^7(x+1)]' = 7 \cdot \sin^6(x+1) \cdot \cos(x+1)$

Erdinç Kuruoğlu

Trigonometrik Dönüşümler:

35-) $\cos(a-b) = \cos a \cdot \cos b + \sin a \cdot \sin b$

36-) $\sin(a+b) = \sin a \cdot \cos b + \cos a \cdot \sin b$

37-) $\cos(a+b) = \cos a \cdot \cos b - \sin a \cdot \sin b$

38-) $\tan(a+b) = \frac{\tan a + \tan b}{1 - \tan a \cdot \tan b}$

39-) $\tan(a-b) = \frac{\tan a - \tan b}{1 + \tan a \cdot \tan b}$

40-) $\sin 2a = 2 \cdot \sin a \cdot \cos a$ 41-) $\sin 4x = 2 \cdot \sin 2x \cdot \cos 2x$

42-) $4 \cdot \sin x \cdot \cos x = 2 \cdot 2 \cdot \sin x \cdot \cos x \cdot 2 \cdot \sin 2x$

43-) $\sin x \cdot \cos y = \frac{1}{2} \cdot [\sin(x+y) + \sin(x-y)]$

44-) $\cos x \cdot \cos y = \frac{1}{2} \cdot [\cos(x+y) + \cos(x-y)]$

45-) $\sin x \cdot \sin y = -\frac{1}{2} \cdot [\cos(x+y) - \cos(x-y)]$

46-) $\sin(x + 2\pi \cdot k) = \sin x$, $\cos(x + 2\pi k) = \cos x$

$\tan(x + \pi k) = \tan x$, $\cot(x + \pi k) = \cot x$

47-) $\sin\theta \Rightarrow 0^\circ = 0$, $30^\circ = \frac{1}{2}$, $45^\circ = \frac{\sqrt{2}}{2}$, $60^\circ = \frac{\sqrt{3}}{2}$, $180^\circ = 0$, $270^\circ = -1$

$\cos\theta \Rightarrow 0^\circ = 1$, $30^\circ = \frac{\sqrt{3}}{2}$, $45^\circ = \frac{\sqrt{2}}{2}$, $60^\circ = \frac{1}{2}$, $90^\circ = 0$, $180^\circ = -1$, $270^\circ = 0$

$\tan\theta \Rightarrow 0^\circ = 0$, $30^\circ = \frac{\sqrt{3}}{3}$, $45^\circ = 1$, $60^\circ = \sqrt{3}$, $90^\circ =$ Tanımsız, $180^\circ = 0$, $270^\circ =$ Tanımsız

$\cot\theta \Rightarrow 0^\circ =$ T, $30^\circ = \sqrt{3}$, $45^\circ = 1$, $60^\circ = \frac{\sqrt{3}}{3}$, $90^\circ = 0$, $180^\circ =$ T, $270^\circ = 0$

48-) $x < 90$

$\sin(90+x) = \cos x$	$\sin(90-x) = \cos x$	$\sin(180+x) = -\sin x$	$\sin(270-x) = -\cos x$
$\cos(90+x) = -\sin x$	$\cos(90-x) = \sin x$	$\cos(180+x) = -\cos x$	$\cos(270+x) = \sin x$
$\cot(90+x) = -\tan x$	$\cot(90-x) = \tan x$	$\cot(180+x) = +\cot x$	$\tan(-x) = -\tan x$
$\tan(90+x) = -\cot x$	$\tan(90-x) = \cot x$	$\tan(180+x) = +\tan x$	$\cot(-x) = -\cot x$

49-) $a,b,c,d \in R \Rightarrow f(x) = a+b \cdot \sin^n(cx+d)$, $g(x) = a+b \cdot \cos^n(cx+d)$

n tek $\Rightarrow$ esas periyot $\frac{2\pi}{|c|}$, n çift $\Rightarrow$ esas periyot $\frac{\pi}{|c|}$

$f(x) = a+b \cdot \tan^n(cx+d)$, $g(x) = a+b \cdot \cot^n(cx+d)$ = $\frac{\pi}{|c|}$

50-) Arcsin, Tanım kümesi $[-1,1]$ Değer kümesi $[-\frac{\pi}{2}, \frac{\pi}{2}]$

Arccos, Tanım aralığı $[-1,1]$, Değerler $[0,\pi]$

Arctan, " R, " $[-\frac{\pi}{2}, \frac{\pi}{2}]$

Arccot, " R, " $[0,\pi]$

51-) $-1 \le \sin\alpha \le 1$, $-1 \le \cos x \le 1$

52-) $\sin A + \sin B = 2 \cdot \sin\left(\frac{A+B}{2}\right) \cdot \cos\left(\frac{A-B}{2}\right)$

$\sin A - \sin B = 2 \cdot \cos\left(\frac{A+B}{2}\right) \cdot \sin\left(\frac{A-B}{2}\right)$

$\cos A + \cos B = 2 \cdot \cos\left(\frac{A+B}{2}\right) \cdot \cos\left(\frac{A-B}{2}\right)$

$\cos A - \cos B = -2 \cdot \sin\left(\frac{A+B}{2}\right) \cdot \sin\left(\frac{A-B}{2}\right)$

53-) $\log\csc x = \log\frac{1}{\sin x} = -\log\sin x \Rightarrow \log\sec x = -\log\cos x$

$\log\cot x = -\log\tan x$

54-) $\alpha + \theta = 90 \Rightarrow \sin\alpha = \cos\theta$, $\tan\alpha = \cot\theta$, $\sec\alpha = \csc\theta$

55-) $\csc x = \frac{1}{\sin x}$ 56-) $1 = \sec^2 x - \tan^2 x$, 57-) $1 = \csc^2 x - \cot^2 x$

58-) $\cos 2x = \cos^2 x - \sin^2 x$, 59-) $\cos 2x = 2 \cdot \cos^2 x - 1$

60-) $\cos 2x = 1 - 2 \cdot \sin^2 x$, 61-) $\tan 2x = \frac{2 \cdot \tan x}{1 - \tan x}$

62-) $\cos^2 x = \frac{\cos 2x + 1}{2}$ 63-) $\sin^2 x = \frac{1 - \cos 2x}{2}$

64-) $\tan x = \frac{\sqrt{1-\cos^2 x}}{\cos x}$ 65-) $\tan x = \frac{\sin x}{\sqrt{1-\sin^2 x}}$

66-) Limit → $\frac{1}{0} = \infty$, $\frac{1}{\infty} = 0$, $\infty + \infty = \infty$, $-\infty \cdot (-\infty) = \infty$, $\frac{-3}{0} = \infty$

67-) Belirsizlikler → $\frac{\infty}{\infty}$, $\frac{0}{0}$, $\frac{\infty}{0}$, $\frac{0}{\infty}$, ∞^0, 0^0, 1^∞, $\infty - \infty$

68-) $\lim_{x \to 0} \frac{\sin x}{x} = 1$ 69-) $\lim_{x \to 0} \frac{\sin 4x}{\tan 7x} = \frac{4}{7}$

70-) LOGARİTMA

$\frac{1}{0} + \frac{1}{1!} + \frac{1}{2!} + \dots = e$, $\log_e x = \ln x$, $\ln e^2 = 2 \cdot \ln e = 2$

$\ln\sqrt[3]{3} = \frac{1}{3} \cdot \ln e$

71-) $\log_a x = y \Rightarrow x = a^y$, $a \ne 1$, $a > 0$, $x > 0$

72-) $\log_a a = 1$, 73-) $\log_{10} x = \log x$

74-) $\log_a(x \cdot y) = \log_a x + \log_a y$, 75-) $\log_a \frac{x}{y} = \log_a x - \log_a y$

76-) $\log_{a^x} y = \frac{1}{x} \cdot \log_a y$ 77-) $4^x = 5 \Rightarrow \log_4 5 = x$

78-) $\log_a 1 = 0$ 79-) $\log_a b^m = \frac{m}{n} \cdot \log_a b$ } $a \in R^+ - \{1\}$

80-) $\log_{a^n} b = \frac{1}{n} \cdot \log_a b$ 81-) $\log_{b^n} a^m = m \cdot \log_b a$ } $n, m \in R$ olmaküzere

82-) $\log_a(x \cdot y) = \log_a x + \log_a y$ 83-) $\log_a(\frac{x}{y}) = \log_a x - \log_a y$

84-) $\log_a b = \frac{\log_c b}{\log_c a}$, 85-) $\log_a b = \frac{1}{\log_b a}$

86-) $\log_a b \cdot \log_b c = \log_a c$ 87-) $\log_a b \cdot \log_c d = \log_a d$

88-) $a^{\log_a b} = b$ 89-) $a^{\log_x b} = b^{\log_x a}$ 90-) $\log_e e = 1$, 91-) $\log_e 1 = 0$

92-) $\ln 1 = 0$ 92-) $\log_e e^2 = 2 \cdot \log_e e = 2$ 93-) $\ln(x \cdot y) = \ln x + \ln y$

94-) $\log_a f(x) = b \Rightarrow a^b = f(x)$ $a > 0$, $a \ne 1$

95-) $\log_a f(x) = \log_a g(x) \Rightarrow f(x) = g(x)$

96-) $a > 1 \rightarrow \log_a f(x) > c \Rightarrow f(x) > a^c$

97-) $a > 1 \rightarrow \log_a f(x) < c \Rightarrow 0 < f(x) < a^c$

98-) $0 < a < 1 \rightarrow \log_a f(x) > c \Rightarrow 0 < f(x) < a^c$

99-) $0 < a < 1 \rightarrow \log_a f(x) < c \Rightarrow f(x) > a^c$

80-) $\lim_{x \to 0} \frac{\tan ax}{bx} = \frac{a}{b}$ 81-) $\lim_{x \to 0} \frac{\sin ax}{bx} = \frac{a}{b}$

Erdinç Kuruoğlu

İntegral.

81-) $\int f'(x)\cdot dx = f(x)+C$ 82-) $\int x^n\cdot dx = \frac{x^{n+1}}{n+1}+C$

83-) $\int c\cdot f(x)\cdot dx = c\cdot\int f(x)\cdot dx$ 84-) $\int (f(x)\mp g(x))\cdot dx = \int f(x)\cdot dx \mp \int g(x)\cdot dx$

85-) $\int dx = x+C$, 86-) $\int x^0\cdot dx = x+C$ 87-) $\int 0\cdot dx = C$

88-) $\int \sin x\cdot dx = -\cos x+C$, 89-) $\int \cos x\cdot dx = \sin x+C$

90-) $\int \sec^2 x\cdot dx = \tan x+C$, 91-) $\int (1+\tan^2 x)\cdot dx = \tan x+C$

92-) $\int \frac{1}{\cos^2 x}\cdot dx = \tan x+C$, 93-) $\int \csc^2 x\cdot dx = -\cot x+C$

94-) $\int \frac{1}{x}\cdot dx = \int \frac{dx}{x} = \ln|x|+C$

95-) $\int \frac{1}{\sqrt{1-x^2}}\cdot dx = \text{Arcsin}x+C = -\text{Arccos}x+C$

96-) $\int \frac{1}{1+x^2}\cdot dx = \text{Arctan}x+C = -\text{Arccot}x+C$

97-) $\int e^x\cdot dx = e^x+C$, 98-) $\int a^x\cdot dx = \frac{a^x}{\ln a}+C$

99-) $d[F(x)] = f'(x)\cdot dx$, 100-) $\int \frac{dx}{ax+b} = \frac{1}{a}\cdot\ln|ax+b|+C$

101-) $\int \sin^2 x\cdot dx = -\frac{1}{3}\cdot\cos x+C$

102-) $\int \cos(a\cdot x+b)\cdot dx = \frac{1}{a}\cdot\sin(a\cdot x+b)+C$

103-) $\int e^x\cdot\sin x\cdot dx = \frac{1}{2}\cdot(\sin x-\cos x)+C$

104-) $\int e^{ax+b}\cdot dx = \frac{1}{a}\cdot e^{ax+b}+C$

105-) $\int e^{-3x}\cdot dx = \frac{1}{-3}\cdot e^{-3x}$, 106-) $\int e^{2x}\cdot dx = \frac{e^{2x}}{2}$

107-) $\int 2^{3x}\cdot dx = \frac{2^{3x}}{3\cdot\ln 2}+C$

108-) $\int \frac{dx}{a\cdot x^2+b\cdot x+c}$ => fonksiyonun Δ'na bakılır
Δ<0 => tam kare gap
Δ>0 => çarpanlarına ayır

109-) Tam kare Yapmanın kolay yolu:

$x^2+4x+7 \Rightarrow \left(\frac{4}{2}\right)^2 = (2)^2 = 4$ eklegip çıkar.

$x^2+4\cdot x+7+4-4 = (x+2)^2+3$

110-) Basit Kesir Yoparak integral Alma:

$\int \frac{dx}{x^2+x} = \int \frac{dx}{(x+1)\cdot x} \Rightarrow \frac{1}{(x+1)\cdot x} = \frac{A}{x}+\frac{B}{x+1} \Rightarrow 1=(A+B)x+Bx$

A+B=0, A=1, B=-1

$\int\left(\frac{1}{x}-\frac{1}{x+1}\right)\cdot dx = \ln|x|-\ln|x+1|+C$

111-) $\int \frac{dx}{x^3+x} \Rightarrow \frac{1}{x\cdot(x^2+1)} = \frac{A}{x}+\frac{Bx+C}{x^2+1}$

Paydadaki derecenin 1 eksiği payın derecesini belirler. (1, -1, 2)

$\Rightarrow (A+B)\cdot x^2+Cx+A = 1$

$\Rightarrow A+B=0,\ C=0,\ B=-1,\ A=1$

112-) Kısmi integrasyon: LAPTÜ (Slow, Arc, Pol, Tir, Üssel)

$\int U\cdot dV = U\cdot V-\int V\cdot dU$, $\int P(x)\cdot e^x\cdot dx = e^x\cdot(P(x)-P'(x)+P''(x)\ldots$

113-) $\int(x^3+x^2)\cdot e^x\cdot dx = e^x[(x^3+x^2)-(3x^2+2x)+(6x+2)-6]+C$

114-) $\int \frac{\sqrt{1+x^2}}{x^2}\cdot dx \Rightarrow$ $\sin u = \frac{1}{\sqrt{1+x^2}}$, $\cos u = \frac{x}{\sqrt{1+x^2}}$

115-) $\int \frac{x}{x^2+p^2}\cdot dx = \frac{1}{2}\int \frac{2x}{x^2+p^2}\cdot dx$ Paydanın türevi Pay'da bulunduğundan $\frac{1}{2}\cdot\ln|x^2+p^2|+C$ olur.

116-) $\int\sqrt{a^2-x^2}\cdot dx = \frac{a^2}{2}\cdot\text{Arcsin}\frac{x}{a}+\frac{x}{a}\cdot\sqrt{a^2-x^2}+C$

117-) $\int\sqrt{a^2+x^2}\cdot dx = \frac{a^2}{2}\cdot\left[\ln\left(x+\sqrt{a^2+x^2}\right)+\frac{x}{a^2}\cdot\sqrt{a^2+x^2}\right]+C$

118-) $\int\sqrt{x^2-a^2}\cdot dx = \frac{a^2}{2}\cdot\left[\sqrt{x^2-a^2}-\ln\left(x+\sqrt{x^2-a^2}\right)\right]+C$

Kural: $\int\sqrt{a^2-x^2}\cdot dx$ => değişken değiş tirme $x = a\cdot\sin t$

119-) $\int\sqrt{x^2-a^2}\cdot dx$ => $x = \frac{a}{\cos t}$ olur 120-) $\int\sqrt{x^2+a^2}\cdot dx$ => $x = a\cdot\tan t$

121-) Kural: f(x) polinom fonksiyon ise

$\int f(x)\cdot e^x\cdot dx = [f(x)-f'(x)+f''(x)-+\ldots]\cdot e^x+C$

122-) $\int\frac{1}{\sqrt{x^2+1}}\cdot dx = \ln|x+\sqrt{x^2+1}|+C$

123-) $\int\frac{1}{\sqrt{x^2-1}}\cdot dx = \ln|x+\sqrt{x^2-1}|+C$

124-) $\int\frac{1}{\sqrt{x^2+h}}\cdot dx = \ln|x+\sqrt{x^2+h}|+C$

125-) $\int(bx+a)^n\cdot dx = \frac{(bx+a)^{n+1}}{b\cdot(n+1)}+C$

126-) $\int\frac{x\cdot dx}{bx+a} = \frac{1}{b^2}\cdot[a+bx-a\cdot\ln(a+bx)]+C$

127-) $\int\frac{x^2}{bx+a}\cdot dx = \frac{1}{b^3}\cdot\left[\frac{1}{2}\cdot(a+bx)^2-2a(a+bx)+a^2\ln(a+b\right.$

128-) $\int\frac{dx}{a^2-x^2} = \frac{1}{2a}\cdot\ln\left(\frac{a+x}{a-x}\right)$

129-) $\int\frac{1}{x^2+a^2}\cdot dx = \frac{1}{a}\cdot\arctan\frac{x}{a}+C$

130-) $\int\frac{1}{x^2-a^2}\cdot dx = \frac{1}{2a}\cdot\ln\left(\frac{x-a}{x+a}\right)$

131-) LAPLACE DÖNÜŞÜMÜ

1-) f(t), $[0,\infty]$ aralığında tanımlı

2-) $|f(t)| \le M\cdot e^{ct}$ olacak biçimde M ve c sabitleri var olsun

$\mathcal{L}\{f(t)\} = \int_0^\infty f(t)\cdot e^{-st}\cdot dt = F(s)$

f(t): Bağımsız değil, s: kompleks değişken

$s = \sigma+j\omega$ $\sigma+j\infty$

$f(t) = \frac{1}{2\pi j}\int_{\sigma-j\infty} e^{st}\cdot F(s)\cdot ds$

132-) LAPLACE DÖNÜŞÜM TABLOSU:

Dönüşüm Tablosu		Özellik Tablosu	
f(t)	F(s)	f(t)	F(s)
$\delta(t)$	1	$K\cdot f(t)$	$K\cdot F(s)$
U(t)	1/s	$f_1(t)\mp f_2(t)$	$F_1(s)\mp F_2(s)$
t	$1/s^2$	$d\,f(t)/dt$	$s\cdot F(s)-f(0^-)$
e^{-at}	$1/(s+a)$	$d^2f(t)/dt^2$	$s^2\cdot F(s)-s\cdot f(0^-)-\frac{d}{dt}f(0^-)$
sinwt	$w/(s^2+w^2)$	$\int_0^t f(t)\cdot dt$	$F(s)/s$
coswt	$s/(s^2+w^2)$	$f(t)\cdot U(t)$	F(s)
$t\cdot e^{-at}$	$1/(s+a)^2$	$f(t-a)\cdot u(t-a)$	$e^{-as}F(s)$ a>0
$e^{-at}\cdot\sin wt$	$w/((s+a)^2+w^2)$	$e^{-at}\cdot f(t)$	F(s+a)
$e^{-at}\cdot\cos wt$	$(s+a)/((s+a)^2+w^2)$		
$\delta(t-T)$	e^{-sT}		
$e^{-at}\cdot U(t)$	$1/(s+a)$		

133-) Ters LAPLACE DÖNÜŞÜMÜ:

En genel Teorem:

$\mathcal{L}^{-1}\left\{\frac{K}{(s+a)^\gamma}\right\} = f(t) = \left(K\cdot t^{\gamma-1}\cdot e^{-at}/(\gamma-1)!\right)$ $t\ge 0^-$ şeklinde ise

1-) $F(s) = \frac{K_1}{s+\alpha}+\frac{K_2}{s+\beta}\ldots$

$K_1 = F(s)\cdot(s+\alpha)\Big|_{s=-\alpha}$ $K_2 = F(s)\cdot(s+\beta)\Big|_{s=-\beta}$

2-) $F(s) = \frac{K}{(s+\alpha)^n} \Rightarrow \frac{K_n}{(s+\alpha)^n}+\frac{K_{n-1}}{(s+\alpha)^{n-1}}+\frac{K_{n-2}}{(s+\alpha)^{n-2}}\ldots$

$K_n = F(s)\cdot(s+\alpha)^n\Big|_{s=-\alpha}$, $K_{n-1} = \frac{1}{1!}\cdot\frac{d}{ds}\cdot[F(s)\cdot(s+\alpha)^n]\Big|_{s=-\alpha}$

$K_{n-2} = \frac{1}{2!}\cdot\frac{d^2}{ds^2}\cdot F(s)\cdot(s+\alpha)^n\Big|_{s=-\alpha}$

3-) $F(s) = \frac{K}{(s+\alpha-j\beta)^n}+\frac{K^*}{(s+\alpha+j\beta)^n}$

$\Rightarrow \mathcal{L}\{F(s)\} = f(t) = \frac{2\cdot|K|\cdot t^{n-1}\cdot e^{-\alpha t}\cdot\cos(\beta t+\theta)}{(n-1)!}$

4-) $F(s) = \frac{K}{s+\alpha-j\beta}+\frac{K^*}{s+\alpha+j\beta}+\ldots$

$\mathcal{L}\{F(s)\} = f(t) = 2\cdot|K|\cdot e^{-\alpha t}\cdot\cos(\beta t+\theta)$ $t\ge 0^-$

5-) $as^2+bs+c \Rightarrow \Delta = \sqrt{b^2-4ac}$

$s_{1,2} = \frac{-b\mp\sqrt{\Delta}}{2a}$, $a+bj \Rightarrow z = |z|\cdot e^{j\theta}$

$|z| = \sqrt{a^2+b^2}$

$\theta = \arctan\left(\frac{b}{a}\right)$

$e^{j\theta} = \cos\theta+j\sin\theta$